Automated Soxhlet Standard Laboratory Module (SLM™)

General Overview of the Automated Soxhlet SLM

This is a modification of a commercial instrument to make it conform to the Contaminant Analysis Automation (CAA) SLM standards.

Environmental Protection Agency (EPA) Method

The Soxhlet instrument has approval to perform USEPA Method 3541, Nonpromulgated (SW-846 Proposed Update II, Nov. 1992) "Automated Soxhlet Extraction."

Standard Analysis Method (SAM)

The Soxhlet SLM would support any Organic SAM system that requires the extraction of semivolatile organic contaminants from solid samples.

Advantages

The hot solvent kinetics of the Automated Soxhlet SLM allow the extraction time to be reduced from 16-24 hours to about 2 hours for PCBs in soil. The original Soxhlet requires a series of operator interventions as the extraction proceeds. For the CAA program the instrument was reconfigured to take over each of the manual steps and perform the actuation under computer control. Additionally, the tasks of monitoring the solvent heights and the presence of an extraction thimble or an extraction beaker are taken care of by the addition of a sensor and using a simple vision system.

General Description of the Automated Soxhlet SLM

The Soxhlet performs a hot solvent extraction in place of the standard cold solvent soxhlet extraction. Technical highlights include an onboard embedded controller for executing the steps in the method and controlling the vision system.

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Figure 1. The Automated Soxhlet SLM.

Each extraction bay employs a camera, which is multiplexed to a common video card in the embedded controller. The use of such simple vision analysis has proven to be easier to implement than other sensor techniques used to detect the level. As required by the CAA SLM protocol, information between the instrument and the task sequence controller is collected in the database for chain-of-custody documentation.

Status

The instrument has been run through rigorous testing by the validation laboratory at Los Alamos National Laboratory and has passed the standard battery of tests. In addition, work has been done to examine the use of the instrument for nonvolatile and semivolatile extractions. Indications based on analysis of the data show viability for this additional use of the instrument.

Industrial Partner

SciBus Analytical, Inc.

Developers

The Department of Energy laboratory responsible for the Automated Soxhlet SLM development is Pacific Northwest Laboratories.

Battelle
Pacific Northwest Laboratories

INEL

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